integrated chip set including a full custom analog and semi-custom digital integrated circuit. The SIT incorporates three different methods for "learning" the characteristics of 4-wire port modular interfaces found in most telephone station sets. These methods determine the appropriate 4-wire terminal configurations, the transmit and receive channels of the intended telephone base unit, and adjust the channel sensitivities until an optimal and clear signal is provided for the user.

Regarding Claim 41, it is stated within the Office Action that the claim limitation "....a handset port of a telephone to a plurality of signal lines from a headset" is not adequately disclosed in the specification. The Applicant respectfully disagrees.

The present application expressly states in the Field of the Invention section that "this invention relates to a device capable of providing a 4-wire interface to any telephone base unit's handset/headset port using 2-wire each send and receive lines." (Present Specification, Page 1, Lines 3-5). Also, the present specification illustrates a "Headset Mic & Rcv" component in Figure 3. (Present Specification, Figure 3). In addition, the present specification expressly states that:

> [a] 28 dB energy variance exists between telephones that are commercially available. Accordingly, in a voice application, a telephone **headset** or other accessory that is configured to work with one telephone base unit could provide an uncomfortably loud signal when used with a second base unit or be significantly quiet when used with a third telephone base unit.

(Present Specification, Page 14, Lines 4-8) (emphasis added). Furthermore, the present specification expressly states that the

> "Automated 800 Learning Method" involves interaction between a "Host" system located at the termination of the accessed telephone line and the "SIT" system located at the end user's location. The user places a call to a designated telephone number and is greeted by an "automated attendant" message. In the case of a voice application such as a **headset interface**, the message instructs the user to momentarily depress the system reset switch 258, place the "handset/headset" switch to the "headset" position and press a key on the telephone set keypad. The keystroke interrupts the "auto attendant" message and the "Host" sends a preamble to the "SIT" system. When the preamble is detected, the "Automated 800 Learning Method" is enabled.

(Present Specification, Page 4, Lines 21-28 through Page 5, Lines 1-2) (emphasis added). Moreover, one intent of the present invention is described in the Background,

> Private phones generally include a telephone base unit and modular accessories, such as a handset/headset. Accordingly, telephone manufacturers can and do develop independent interface systems between their telephone base units and accessories such as handsets/headsets. This often precludes the use of a different type of handset/headset with a particular base unit without manual reprogramming. The problem is especially apparent when dealing with Key and Private Branch Exchange (PBX) system station sets which are entirely proprietary in nature. Many manufacturers are providing accessories which are provided as original equipment with the base unit. Many of these accessory products provide both voice and data solutions not offered in the telephone station sets such as headset, teleconferencing, facsimile and modem communication alternatives. What is needed is an invention that will allow a user to automatically calibrate a commercially available non-regulated voice/data product to allow an effective interface. This would solve any incompatibility problems and provide users with greater choices and flexibility when selecting telephone equipment.

(Present Specification, Page 1, Lines 22-26 through Page 2, Lines 1-10).

As stated in the paragraph directly above, the present application describes the term "accessory" to include a headset. Thus, the present invention describes a headset to be one type of accessory that is used in conjunction with the Smart Interface Technology to connect the headset to a telephone base. The headset as one type of accessory is further discussed in the specification in that the connection between a telephone set 54 or 58 and a telephone accessory 60 or 62 is also not regulated and unless the accessory and telephone is designed to interface, the accessory will not operate with the telephone base. Thus, the present invention alleviates this problem in providing a Smart Interface Technology interface which provides an interface between accessories 60 and 62 and the telephone base 54 and 58 that have different protocols. (Present Specification, Page 6, Lines 22-27). Further, the present invention illustrates this concept as the "Voice/Data Accessory 2-Wire" 60 and "Voice/Data Accessory 4-Wire" 62 shown in Figure 6. (Present Specification, Figure 6).

One skilled in the art would understand that the headset has a plurality of signal lines which allow the headset to communicate with the telephone base unit. Nonetheless, the present specification expressly states that this invention relates to a device capable of providing a 4-wire interface to any telephone base unit's handset/headset port using 2-wire each send and receive lines." (Present Specification, Page 1, Lines 3-5). For at least these reasons, it is well established in the specification of the present invention that the inventor had possession of the invention recited in the claim limitation in Claim 41 at the time of filing. Therefore, Claim 41 overcomes the rejection and is allowable.

Regarding Claim 42, it is stated within the Office Action that the claim limitation "....each switch configuration in the plurality of switch configurations comprises a predetermined setting for each of the plurality of switches" is not supported in the specification of the present application. The Applicant respectfully disagrees.

In the present specification, it is stated that the present invention will select the most common configurations of lines which satisfy the system's performance criteria. (Present Specification, Page 5, Lines 25-28). It is also shown in Figure 9 that the crosspoint switch array has a plurality of switches settable to any of a plurality of switch configurations. Figure 9 also illustrates that each switch configuration has a predetermined setting. For instance in Figure 9, one predetermined setting could include a switch configuration in which switches 0, 5, 9, and 12 are turned on and lines b0, b5, b9 and b12 are connected to RX1, RX2, TX1 and TX2. In another instance, another predetermined setting could include another switch configuration in which switches 3, 5, 9, and 15 are turned on and lines b3, b5, b9 and b15 are connected to RX1, RX2, TX1 and TX2. Therefore, the present specification teaches a predetermined setting for each of the plurality of switches. For at least these reasons, one skilled in the art would understand that the Applicant had possession of the claim limitation, "...a predetermined setting for each of the plurality of switches" in Claim 42. Therefore, Claim 42 is fully described and supported in the specification and overcomes the rejection.

Regarding Claim 44, it is stated within the Office Action that the claim limitation "....the switch matrix comprises a plurality of relays, the plurality of relays coupling the plurality of handset port signal lines" is not supported in the specification of the present application. The Applicant respectfully disagrees. Figure 9 of the present application illustrates a block diagram of a 4x4 crosspoint switch and shunt resistor arrays. The present specification states that the crosspoint switch array includes of a 4x4 matrix of analog switches designed to connect lines 1-4 of the 4-wire phone port 202 to the two transmit and two receive channels (Rx and Tx) of a handset. (Present Specification, Page 18, Lines 21-23). The 100 ohm resistor shunt array 3 contains six switchable shunt resistors and is configured in parallel with the crosspoint switch array 2 input ports. (Present Specification, Page 13, Lines 15-17). Further, Figure 4 of the present specification illustrates the Smart Interface Technology having a plurality of switches in the configuration switch box which is coupled to the transmit and receive lines as well as coupled to the telephone jack terminals. (Present Specification, Figure 4). For at least these reasons, one skilled in the art would understand that the Applicant had possession of the claim limitation,

"...the switch matrix comprises a plurality of relays, the plurality of relays coupling the plurality of handset port signal lines" in Claim 44. Therefore, Claim 44 is fully supported and described in the specification and overcomes the rejection.

Regarding Claim 45, it is stated within the Office Action that the claim limitation "....the switch matrix is based on a cascading architecture" is not supported in the specification of the present application. The Applicant respectfully disagrees. As stated above, Figure 9 of the present application illustrates a block diagram of a 4x4 switch array having a cascading architecture. The switches shown in the 4x4 switch array in Figure 9 are arranged in a series with respect to each signal line. (Present Specification, Figure 9). The crosspoint switch array in Figure 9 has four input ports which are directly coupled to a four line telephone base unit jack 202 or handset port through the array 3, as illustrated by the lines 1-4. (Present Specification, Figure 9). In addition, the crosspoint switch is coupled to the shunt array which contains six switchable shunt resistors and is configured in parallel with the crosspoint switch array input ports. (Present Specification, Page 13, Lines 15-17). The shunt array is coupled to Pins 1-4 and the crosspoint switch is coupled to the outputs of the latch b0-b15 as well as the transmit and receive signal lines (Rx and Tx). For instance, when Switch 0 in the crosspoint switch array is on, the Pin 1 is connected to RX1 and latch output b0. Similarly, if Switch 4 is on, Pin1 is connected to RX2 and latch output b4. Thus, the output of Switch 4 can serve as the input to Switch 0 as well as other switches, such as Switch S1-4 in the shunt array. Therefore, the crosspoint switch has a cascading architecture. For at least these reasons, one skilled in the art would understand that the Applicant had possession of the claim limitation, "...the switch matrix is based on a cascading architecture" in Claim 45. Therefore, Claim 45 is fully described and supported in the specification and overcomes the rejection.

Regarding Claim 46, it is stated within the Office Action that the claim limitation "....a signal level detector that generates an output signal, the output signal indicating a level of an input signal to the signal level detector" is not supported in the specification of the present application. In particular, it is stated within the Office Action that the Applicant's disclosure recites a dial tone detector that does not differentiate between various levels of the tone. The Applicant respectfully disagrees.

The present specification states in reference to Figure 7 that a:

> receive signal Rx REF OUT of the analog integrated circuit 200 is coupled to the analog/digital (A/D) input of the digital MCU 100 and provides a sample of the input signal which the analog integrated circuit 200 receives from the telephone base unit. The digital MCU 100 uses this information to determine if the appropriate line configuration has been selected and to control the receive and transmit channel sensitivities.

(Present Specification, Page 7, Lines 18-22). In addition, the specification states that a:

> signal TONE OUT from the digital MCU 100 is coupled to an input TXREF of the analog integrated circuit 200 and allows the digital MCU 100 to provide a 1 KHz calibration transmit tone, through the analog integrated circuit 200, to facilitate the appropriate selections of the transmit lines and transmit channel sensitivity setting.

(Present Specification, Page 7, Lines 24-27). Furthermore, in reference to the analog integrated circuit shown in Figure 8, the present specification teaches that the

> digital MCU 100 monitors the receive signal by sampling the signal through the receive level reference port RX LEVEL REF. The receive signal sample for the digital MCU 100 is taken at the output of the receive step attenuator RX-2 and is filtered by the dialtone filter RX-6, then the anti-alias filter RX-7. The receive signal sample is finally coupled into the sample and hold circuit RX-8 prior to being passed on to the receive level reference port RX LEVEL REF. The receive level reference port RX LEVEL REF is coupled directly to the A/D input of the digital MCU 100. The digital MCU 100 controls the dialtone filter RX-6, anti-alias filter RX-7 and sample and hold circuit RX-8 via the 32 bit addressable latch 1 and synchronizes these switched capacitor filters with the use of the clock circuitry shown in the blocks 7, 8, 9 and 10.

(Present Specification, Page 15, Lines 13-23). In other words, the present specification states that the analog circuit in the present invention provides an input signal to the MCU, whereby the MCU determines whether the appropriate line configuration was selected by analyzing the input signal. The MCU then provides a 1 KHz calibration tone to aid the analog integrated circuit in selecting the appropriate line configurations and channel sensitivities based on the input signal received. For at least these reasons, one skilled in the art would understand that the Applicant had possession of the claim limitation, "....a signal level detector that generates an output signal, the output signal indicating a level of an input signal to the signal level detector" in Claim 46. Therefore, Claim 46 is fully described and supported in the specification and overcomes the rejection.

Regarding Claim 50, it is stated within the Office Action that the claim limitation "....the interface unit further comprises a variable gain circuit" is not supported in the specification of the present application. The Applicant respectfully disagrees. The present specification specifically states

> The equalized receive signal is then coupled to the voltage controlled amplifier RX-3 which can have fixed gain or allow the user to manually control the volume level of the receive signal through a port RX VC IN which is coupled to the voltage controlled amplifier RX-3. An output of the automatic level control circuit RX-5 is also coupled to an ALC control input on the voltage controlled amplifier RX-3 and is capable of controlling the amplifier gain.

(Present Specification, Page 14, Lines 17-22). In addition,

> The automatic level control circuit RX-5 acts as a dynamic output limiting system with an overall dynamic range of 40 dB. The automatic level control circuit RX-5 input samples the output level of the receive channel and has a selectable limiting threshold as shown in Figure 7 which is adjusted using the ALC level adjust circuit 260. The automatic level control circuit RX-5 is capable of limiting the output level of the receive signal to a predetermined level to prevent large unwanted and potentially harmful signals from reaching a user. In voice applications, the user's ears will be protected from prolonged high decibel sounds by the automatic level control circuit RX-5, thereby preventing potential damage to the user's hearing. The ALC timing capacitors 214 and 216, illustrated in Figure 7, are coupled to the pins ALC TC1 and ALC TC2 and are used to set the attack and release timing characteristics of the ALC circuit RX-5.

(Present Specification, Page 14, Lines 23-28 to Page 15, Lines 1-6). The above description is also illustrated in Figures 7 and 8 of the present specification. In other words, the present invention has a voltage controlled amplifier which allows the user to manually control the volume level. In addition, the automatic level control circuit is variably adjustable to limit the output level of the receive signal. For at least these reasons, one skilled in the art would understand that the Applicant had possession of the claim limitation, ""....the interface unit further comprises a variable gain circuit" in Claim 50. Therefore, Claim 50 is fully described and supported in the specification and overcomes the rejection.

Regarding Claim 51, it is stated within the Office Action that the claim limitation "....receives a first gain signal and a second gain signal from the handset port transmit path" is not supported in the specification of the present application. The Applicant respectfully disagrees. As described in the present specification, Rx refers to the receive lines of the telephone handset port. As stated above, the automatic level control circuit samples the signal

from the receive channel and adjusts the output level to prevent unwanted and potentially harmful signals from reaching the user. In addition, it is specifically stated within the present specification that:

> The equalized receive signal is output from the receive VCA RX-3 and coupled as an input to the receive output amplifier RX-4 which is capable of driving resistive, capacitive and inductive loads via the receive output port RX OUT for compatibility with voice or data interfaces. The filtering capacitors 222 and 224, illustrated in Figure 6, and coupled to the pins RX FILT1 and RX FILT2 of the circuit 200 are used to determine the receive channel frequency response.
>
> The digital MCU 100 monitors the receive signal by sampling the signal through the receive level reference port RX LEVEL REF. The receive signal sample for the digital MCU 100 is taken at the output of the receive step attenuator RX-2 and is filtered by the dialtone filter RX-6, then the anti-alias filter RX-7. The receive signal sample is finally coupled into the sample and hold circuit RX-8 prior to being passed on to the receive level reference port RX LEVEL REF. The receive level reference port RX LEVEL REF is coupled directly to the A/D input of the digital MCU 100.

(Present Specification, Page 14, Lines 23-28 to Page 15, Lines 1-6). In other words, as shown in Figures 7 and 8, the Rx Differential Filter RX-1 receives a first signal Rx1 and a second signal Rx2, whereby the Rx Differential Filter is coupled to the Rx VCA automatic level control input RX-3 which is coupled to the automatic level control circuit RX-5. It is stated above that the automatic level control RX-5 is adjustable in response to the received signals (Present Specification, Page 14, Lines 23-28 to Page 15, Lines 1-6). For at least these reasons, one skilled in the art would understand that the Applicant had possession of the claim limitation, "a first gain signal and a second gain signal from the handset port transmit path" in Claim 51. Therefore, Claim 51 is fully described and supported in the specification and overcomes the rejection.

Regarding Claim 56, it is stated within the Office Action that the claim limitation "....a self configuring headset and telephone interface unit comprising a headset" is not supported in the specification of the present application. The Applicant respectfully disagrees. As stated above with regard to Claim 41, the present specification adequately describes and discloses a headset, as claimed in Claim 56. In particular, the present specification describes the term "accessory" to include a headset. The headset as one type of accessory is further discussed in the specification in that the connection between a telephone set 54 or 58 and a telephone accessory 60 or 62 is also not regulated and unless the accessory and telephone is designed to interface, the accessory will not operate with the telephone base. Thus, the present invention alleviates this problem in providing a Smart Interface Technology interface which provides an interface between accessories 60 and 62 and the telephone base 54 and 58 that have different protocols.

(Present Specification, Page 6, Lines 22-27). Further, the present specification illustrates this concept as the "Voice/Data Accessory 2-Wire" 60 and "Voice/Data Accessory 4-Wire" 62 shown in Figure 6. For at least these reasons, one skilled in the art would understand that the Applicant had possession of the claim limitation, "...a self configuring headset and telephone interface unit comprising a headset" in Claim 56 in the specification. Therefore, Claim 56 is fully described and supported in the specification and overcomes the rejection.

Regarding Claim 57, it is stated within the Office Action that the claim limitation "....measuring a signal on the headset receive path resulting from the test signal is not supported in the specification of the present application. In particular, it is stated within the Office Action that sensing a signal is different than measuring a signal. The Applicant respectfully disagrees.

As stated above in relation to Claim 46, the present specification adequately discloses measuring a signal from the test signal. The present specification states:

> The digital MCU 100 will begin manipulating the crosspoint switch array 2 by sequentially coupling pairs of the transmit output ports starting with the most probable pairs defined in the system algorithms. A description, which illustrates the system's switching algorithms, is shown in detail in Figures 4 and 5. The 1 KHz transmit calibration signal is therefore applied to the telephone base unit via the jack lines 202 until the 1 KHz signal is sensed by the digital MCU 100 at the receive level reference output RX LEVEL REF. When the digital MCU 100 senses the 1 KHz signal it will have successfully located the appropriate transmit lines and will latch the information and begin the transmit output step attenuator TX-5 adjustment.

(Present Specification, Page 17, Lines 5-13). In addition, the present specification expressly states that the SIT system compares the 1 KHz signal from the host to an internal reference to ensure proper set up and calibration of the SIT system. (Present Specification, Page 5, Lines 7-9). In other words, the MCU 100 effectively measures the signals by determining whether the signal is actually present in the line. For example, one can measure a full glass of water by comparing the full glass of water with an empty glass of water. Applying this analogy to the present case, the MCU 100 measures the signal by determining that the signal is present in the line in contrast to the MCU 100 measuring the signal by determining that the signal is not present in the line. For at least these reasons, one skilled in the art would understand that the Applicant had possession of the claim limitation, "...measuring a signal on the headset receive path resulting from the test signal" in Claim 57. Therefore, Claim 57 is fully described and supported in the specification and overcomes the rejection.

For the reasons given above, the Applicants respectfully submit that the Claims 41-58 and 60-63 are in a condition for allowance. Should the Examiner have any questions or comments, the Examiner is encouraged to call the undersigned at (408) 530-9700 to discuss the same so that any outstanding issues can be expeditiously resolved.

Respectfully submitted,
HAVERSTOCK & OWENS LLP

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